United States Department of Agriculture | Forest Service | Northeastern Area State & Private Forestry | 180 Canfield Street Morgantown, WV 26505-3101

File Code: 3400
Date: January 5, 2006

Mr. Daniel Balser
Ohio Department of Natural Resources
Division of Forestry
2045 Morse Road, Building H-1
Columbus, OH 43229

Dear Dan:

I have enclosed an article recently published in the *The Forestry Source*- "Here's How to Identify and Mange Bacterial Leaf Scorch", and a progress report for a USFS grant "Epidemiology, vector ecology, and economic impact of BLS in New Jersey. Both are the result of work conducted by Ann Gould and Jim Lashomb, of Rutgers University.

Bacterial leaf scorch is a major problem causing decline and ultimately the removal of landscape and street trees in many New Jersey communities. In some New Jersey communities, over 40% of shade trees show symptoms of the disease, symptoms of the disease showed an upward climb of 40% on shade trees. The New Jersey Forest Service, Urban and Community Forestry Program considers BLS to be one of, if not the most, significant urban tree health problem it faces.

We know that BLS is affecting urban trees in other areas throughout the East and as far West as Texas. But we do not know very much about the severity of the problem outside of New Jersey. A lack of awareness about BLS may contribute to the misidentification of the cause of tree decline in urban areas.

Al Iskra, of our office, and Ann Gould have been documenting not only the occurrence of BLS in communities but also the monetary impact to communities in terms of pruning and tree removal. This can amount to hundreds of thousands of dollars for individual communities.

Sincerely,

DAN

DANIEL B. TWARDUS
Group Leader, Forest Health Protection
Morgantown Field Office

Cc: Jerry Boughton
Kerry Britton

United States Department of Agriculture | **Forest Service** | **Northeastern Area State & Private Forestry** | **180 Canfield Street Morgantown, WV 26505-3101**

File Code: 3400
Date: January 5, 2006

Dr. Donald Eggen
Pennsylvania Division of Forest Pest Management
Bureau of Forestry
Department of Conservation and Natural Resources
208 Airport Drive H.I.A.
Middletown, PA 17057

Dear Donald:

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United States Department of Agriculture

Forest Service

Northeastern Area State & Private Forestry

180 Canfield Street
Morgantown, WV 26505-3101

File Code: 3400
Date: January 5, 2006

Mr. Clark Haynes
West Virginia Department of Agriculture
Plant Industries Division
1900 Kanawha Boulevard, East
Charleston, WV 25305-0191

Dear Clark:

I have enclosed an article recently published in the *The Forestry Source*- "Here's How to Identify and Mange Bacterial Leaf Scorch", and a progress report for a USFS grant "Epidemiology, vector ecology, and economic impact of BLS in New Jersey. Both are the result of work conducted by Ann Gould and Jim Lashomb, of Rutgers University.

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File Code: 3400
Date: January 5, 2006

Mr. Robert Tichenor
Maryland Department of Agriculture
Wayne A Crawley Jr. Building
50 Harry S Truman Parkway
Annapolis, MD 21401-8960

Dear Bob:

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Kerry Britton

United States Department of Agriculture

Forest Service

Northeastern Area State & Private Forestry

180 Canfield Street
Morgantown, WV 26505-3101

File Code: 3400
Date: January 5, 2006

Mr. Glen (Dode) Gladders
Delaware Department of Agriculture
2320 South DuPont Highway
Dover, DE 19901-5515

Dear Dode:

I have enclosed an article recently published in the *The Forestry Source*- "Here's How to Identify and Mange Bacterial Leaf Scorch", and a progress report for a USFS grant "Epidemiology, vector ecology, and economic impact of BLS in New Jersey. Both are the result of work conducted by Ann Gould and Jim Lashomb, of Rutgers University.

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United States Department of Agriculture | Forest Service | Northeastern Area State & Private Forestry | 180 Canfield Street Morgantown, WV 26505-3101

File Code: 3400
Date: January 5, 2006

Mr. George P. Koeck
New Jersey Division of Parks and Forestry
501 East State Street, Station Plazq 5
Trenton, NJ 08625-0404

Dear George:

I have enclosed an article recently published in the *The Forestry Source*- "Here's How to Identify and Mange Bacterial Leaf Scorch", and a progress report for a USFS grant "Epidemiology, vector ecology, and economic impact of BLS in New Jersey. Both are the result of work conducted by Ann Gould and Jim Lashomb, of Rutgers University.

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Kerry Britton

Here's How to ... Identify and Manage Bacterial Leaf Scorch in Shade Trees

By Ann Brooks Gould and James H. Lashomb

Bacterial leaf scorch (BLS) affects many shade tree species such as American elm, red maple, sweet gum, sycamore, and London plane, and several species of oak. The disease has been identified in the urban forest (landscapes, street plantings, and small woodlots) throughout the eastern United States and as far west as Texas.

Leaf Scorching in Shade Trees

Leaf scorch in plants can be attributed to biotic agents or abiotic (or environmental) stresses such as moisture extremes, wind, salt, air pollutants, toxic metals, and nutrient extremes. In most cases, this type of scorching is fairly uniform around leaf edges, affects newer leaves as well as older leaves, will appear on vast expanses of the canopy, and may also develop soon after a known stress (such as drought or a salt application) occurs.

Plant infection by living or biotic agents (such as fungi, bacteria, nematodes, and viruses) also can result in leaf scorching, but this type of scorching is not clearly defined on the plant. Symptoms on leaves are often irregular in shape and, as is the case for BLS, may include a yellow or red "band" between green and scorched tissues. In addition, symptoms may appear first on leaves of one or more branches, and then, over time, on other parts of the tree.

Symptoms

Symptoms of BLS vary by shade tree host, but in most cases the disease is identified by a characteristic marginal leaf scorch. Symptoms first appear in late summer to early fall. In trees with determinate growth, such as oak, the scorching appears on leaves of all ages at about the same time. In trees with indeterminate growth, such as sycamore and elm, symptoms progress from older to younger leaves. Affected leaves may curl and drop prematurely, and as the disease progresses over several years, branches die and the tree declines. Elms may be killed outright by the disease; other affected species eventually decline to the point when the dead branches pose a risk, and the tree must be removed. The process of tree decline may occur quickly or slowly, perhaps depending on the tree and the environment. Epicormic sprouts may be prominent on severely diseased trees, and scale insects, borers, Armillaria root rot, and other biotic diseases may be present as secondary pests. For detailed information regarding symptoms of BLS on specific tree species, go to www.apsnet.org/online/feature/bls/.

Edward L. Barnard, www.forestryimages.org

Symptoms of bacterial leaf scorch vary by shade tree host, but in most cases the disease is identified by a characteristic scorch around the edges of leaves.

Disease Management

Historically, management of the diseases caused by the BLS pathogen *Xylella fastidiosa,* a bacterium, has encompassed several strategies such as reducing host stress; planting hosts not known to harbor the bacterium; and removing infected hosts, vectors, and alternative hosts. In shade trees, it is not known whether therapeutic pruning (removing infected branches as they become symptomatic) or removing infected trees stops the spread of the disease, both within a tree or within populations of trees. Indeed, the random incidence of BLS within a tree planting leads one to suspect that *X. fastidiosa* also does not spread through root grafts, but this method of transmission has yet to be investigated. Management of BLS is further made difficult because it is not known how long hosts may remain asymptomatic prior to the first expression of symptoms.

The use of the antibiotic oxytetracycline to control *X. fastidiosa* has been attempted on hosts such as grape, plum, and shade trees. Such trunk injections provide only temporary relief from symptoms, do not work well in trees with advanced disease, and must be repeated annually to be effective. Further studies are needed to determine whether such antibiotic injections are effective long term or whether these compounds may be phytotoxic to trees treated for long periods. Management of the diseases caused by *X. fastidiosa* through vector eradication has been attempted, but even with Pierce's disease, where disease vectors are known, results are inconclusive. Trials evaluating the systemic insecticide imidacloprid are under way in infected shade trees. This compound is applied in a noninvasive manner to trees as a soil injection and is retained in the canopy for a 3-year period. Ultimately, vector eradication may be useful only to prevent or reduce the rate of spread to adjacent plantings. More novel means for control of *X. fastidiosa* in grapes, such as biological control or biofilm disruption, are currently under study, but use of such techniques for BLS of shade trees may not be feasible for years to come.

There are few cost-effective methods for the management of BLS in landscape plantings. Current management options include

▶ *Maintaining plant vigor.* The best management tool for this disease is to maintain tree vigor. The development of BLS is enhanced by other diseases, insects, and environmental stresses such as drought. BLS also may predispose infected plants to other disease and insect problems.

▶ *Practicing sanitation.* Branches that have died due to BLS pose a risk and should be removed routinely. Infected trees that are in a severe state of decline also should be removed.

▶ *Using tolerant plants.* In areas where BLS occurs, avoid planting highly susceptible trees, and design new tree plantings with a diverse complement of tree species. Management of BLS in many regions of the eastern United States may ultimately depend on the identification of germ plasm tolerant to the disease.

This article was adapted from "Bacterial Leaf Scorch in Shade Trees" by Ann Brooks Gould and James H. Lashomb, published on the American Phytopathological Society's website at www.apsnet.org/online/feature/bls/.

For more information, contact Ann Brooks Gould, associate extension specialist, Department of Plant Biology and Pathology, Rutgers University, Cook College, New Brunswick, NJ 08901; gould@aesop.rutgers.edu.

EPIDEMIOLOGY, VECTOR ECOLOGY, AND ECONOMIC IMPACT OF BACTERIAL LEAF SCORCH IN NEW JERSEY

Progress Report, 2004-2005
USFS

TEAM LEADERS:

Ann Brooks Gould
Department of Plant Biology and Pathology
370 Foran Hall
Cook College
732-932-9400 ext. 332
FAX: 732-932-9377
gould@aesop.rutgers.edu

James H. Lashomb
Department of Entomology
120 Blake Hall
Cook College
732-932-9459
FAX: 732-932-7229
lashomb@rci.rutgers.edu

INTRODUCTION

Bacterial leaf scorch (BLS) of shade trees is a disease that affects oak, sycamore, elm, mulberry, and maple throughout the eastern United States. BLS is one of a group of diseases caused by the xylem-limited bacterium *Xylella fastidiosa*. *Xylella* is distributed throughout the Western Hemisphere, has a very wide host range (more than 120 genera in 30 families), and causes diseases in a number of economically important hosts including peach, grape, plum, pear; periwinkle, alfalfa; almond, citrus, oleander, and coffee. The bacterium also resides in alternative hosts, many of them common landscape ornamentals and weeds, where it may cause no discernible symptoms of disease.

In New Jersey, BLS causes leaf scorch and decline primarily on mature red and pin oaks planted as landscape and street trees. The disease was first identified in Camden, Gloucester, and Burlington counties more than 15 years ago and has since increased to alarming proportions (up to 44%) in some residential neighborhoods, municipal parks, golf courses, and woodlots around the State. In susceptible oaks, water stress caused by the pathogen results in leaf scorching in late summer. Infected trees gradually decline and die, often in 5 years or less. *Xylella* is transmitted by xylem-feeding insects, including sharpshooter leafhoppers and treehoppers. The identity of specific insect vectors in oak, however, and their life history and feeding patterns, are unknown.

Currently, there are few cost-effective methods for the management of this disease. Antibiotics injected in symptomatic trees are not curative and are only efficacious for a short time. With no proven rescue technology, arborists are forced to remove trees to prevent substantial liabilities that may result from falling branches in declining trees. Diseased trees cost several thousand dollars to remove and can reduce property values by 20%. Moreover, replacement trees take years to establish and become valuable additions to affected landscapes. Preliminary analysis of the economic impact of this disease in two New Jersey communities affected by BLS indicates that these municipalities will sustain, and must plan for, losses from \$0.7-1.6 million during the next 10-year period.

In spite of the widespread distribution of BLS in New Jersey, very little is known of the basic biology of the disease, its progression, and management strategies. The disease in

shade trees is often missed or misdiagnosed because *X. fastidiosa* has been historically difficult to isolate and causes symptoms similar to that of other agents. Methods for monitoring potential insect vectors in the canopy are primitive, and little is known regarding the transmission rate and spread of this disease both within and between trees. More information regarding the pattern of disease spread, the seasonal cycles of insect vectors, and the role of alternative, "potential-reservoir" hosts on disease development is needed before effective management strategies can be devised. If uninvestigated and untreated, BLS will continue to debilitate municipalities where widespread overplanting of red and pin oaks has occurred.

OBJECTIVES AND CURRENT PROGRESS

The procedures for most objectives are already underway. To complete all objectives, preliminary identification and assessment of the incidence of BLS in several test communities in New Jersey has been necessary. Since 2002, thorough disease assessment through ground surveys has been made in several communities (Cranbury, Allentown, and East Windsor), with plans for a fourth location in 2006. Additional sites have been identified for vector and alternative host vegetation studies (Mercer County Community College, the Doris Duke Estate, Somerset County, Rutgers Gardens, New Brunswick, and Riverview Cemetery, Trenton); trees at these locations are used for xylem fluid chemistry analysis and are sources of isolates for characterization of *X. fastidiosa* strains.

1. Assess incidence and economic impact of BLS in New Jersey.

Many different species of oak are reported as hosts of BLS in varying U.S. locations. Of these, Northern red and pin oaks are most commonly affected in the New Jersey urban forest; incidence on other oaks and shade trees species is rare. Since BLS was first identified in Camden, Gloucester, and Burlington counties in the mid 1980s, disease incidence in these counties has continued to rise (Figure 1), and populations of diseased trees in nearly every county of New Jersey have been detected.

Figure 1. Spread of bacterial leaf scorch of oak in New Jersey from first detection (ca. 1985) to 2005.

O Mid-1980s
O Early 1990s
O Late 1990s
O 2000-2005

Rutgers University BLS Working Group, Community Survey. Gould, Lashomb, and Hamilton established a baseline census population of trees in Cranbury and Allentown in 2001. This ground survey was expanded in 2002 on redefined criteria, and in 2003, East Windsor and two new subdevelopments of Cranbury were included. The survey has now completed its fourth year of a five-year effort, with plans to include portions of Princeton Township in 2006. Within each community, the species of all street trees were recorded, and all street oaks were further geo-referenced using global positioning systems and mapped using GIS-based mapping software. Recorded for each oak were symptom severity, degree of canopy dieback, trunk diameter, and (for pin oak) degree of canopy transparency. Trees symptomatic for BLS were confirmed for *X. fastidiosa* at the Rutgers Plant Diagnostic Laboratory by using ELISA.

From 2002 to 2004 (data from 2005 are under analysis), the incidence of BLS in Allentown (Monmouth County) varied from 38 to 44% (Table 1). Although disease incidence in Cranbury (Middlesex County) and East Windsor (Mercer County) was lower, BLS still affected a sizeable portion of the oak street tree resource. Disease incidence in the two relatively new developments in Cranbury was low (4%), but all infected trees were highly symptomatic (61%). In most surveys, average crown dieback of symptomatic oaks was between 15 and 30%. With the exception of one sweetgum, all other shade trees species examined during the survey appeared to be free of the disease.

Table 1. Disease incidence of BLS in three New Jersey communities surveyed 2002 to 2004.

Community	Appx. number of oaks	Year of survey 2002	2003	2004
			(%)	
Allentown	200	38	44	44
Cranbury	450	31	27	28
East Windsor	1100	---	7	21

To detect spatial relationships among trees, disease incidence maps were generated using GPS coordinates and an autocorrelation analysis was performed. In a preliminary examination of 2002 data Allentown, the condition of trees within 20-25 m was correlated, which means that diseased trees were clustered in the landscape. Similar analysis for Cranbury revealed a more random pattern. Using GPS-GIS technology, we hope to determine whether geographic features as well as other underlying features (e.g., soil type, hydrology, water table, topography) may be associated with disease predisposition and vector movement. An infrared signature for diseased trees is currently sought for early detection of the disease prior to visible symptom development.

A preliminary economic analysis (in current dollars) of the impact of BLS within Cranbury and Allentown was computed on data taken in 2002. In these communities, oak comprises a sizeable portion of the street tree resource in both Allentown (25%, second only to maple at 38%) and Cranbury (35%, followed by maple at 28%). Economic impact was based on the assumptions that diseased trees with >25% canopy dieback in 2002 will decline and become serious hazard trees within a 5-year period, and trees with <25% dieback will be similarly affected in 10 years. Tree value (in current dollars) was assessed as $8000 per tree (using the "trunk formula method" for trees in the northeast with an average 26-inch dbh). Tree removal costs ($2000) include stump grinding. Thus, loss of tree value for symptomatic oaks in Cranbury within the next 10 years is estimated at $1.6 million. Because there are fewer trees in Allentown, loss of 71 trees symptomatic for BLS is about $710,000. We estimate that these two communities may expect to sustain, and plan for, losses of more than $2 million because of BLS.

We do not yet know the precise point at which the degree of crown decline will prompt homeowners and municipal arborists to remove symptomatic trees, but we do know that tree removal has begun in these communities and homeowners are paying to have

these trees pruned. Certainly, trees with 25 to 30% canopy dieback will become a safety issue. As the disease spreads and becomes more severe, BLS will constitute a greater drain on municipal and homeowner resources. The working group GIS data set constitutes a unique opportunity to follow the street tree resource as the disease progresses.

2. **Refine techniques for insect collection to adequately study potential vector life history.**

Xylella fastidiosa is transmitted by xylem-feeding insects with piercing-sucking mouthparts, such as leafhoppers in the subfamily Cicadellinae. The identity of specific insect vectors is known, however, for only a few hosts, and information regarding the identity of possible vector(s) of the bacterium in oak or other shade tree hosts is minimal.

Vector population dynamics. Studies regarding vector behavior are on-going by the Rutgers University BLS working group; xylem feeder population dynamics have been monitored using refined collection techniques at four research locations (Mercer County Community College, the Doris Duke Estate, Riverview Cemetery, and Rutgers Gardens) since 2002. Of 2000+ insects collected, 34 species leafhoppers and 13 species of treehoppers have been identified. Xylem-feeding leafhoppers include species of *Graphocephala*, *Oncometopia*, *Aulacizer*, and *Draeculacephala*; several of these are known vectors of *X. fastidiosa* in other host systems and are priority targets for further study. Membracids include species of *Archasia*, *Atymna*, *Cyrtolobus*, *Enchenopa*, *Glossonotus*, *Ophiderma*, *Telamona*, and *Thelia*. Populations of xylem feeders at each site are seasonally influenced; the number of insects collected was greatest in early summer for treehoppers and mid- to late summer for leafhoppers. In addition, populations of xylem feeders tend to be significantly greater in asymptomatic oaks (Table 2). Although we have a much better understanding of the population dynamics of xylem feeding insects in trees affected by BLS, the role of any of these insects, indeed there may be more than several species involved, in the epidemiology and spread of BLS is not confirmed, since transmission studies have yet to be completed.

Table 2. Populations of xylem-feeding insects per pin oak tree at Mercer County Community College collected by fogging on three dates in 2004.

	Sampling date		
BLS	**6/17/04**	**7/16/04**	**8/24/04**
		(Total no. of insects per tree)	
Asymptomatic	129.0 a[z]	50.5 a	2.3 a
Symptomatic	28.8 b	4.5 b	3.0 b

[z] Means in a column with the same letter are not significantly different at $P < 0.05$.

3. **Assess the impact of alternative hosts on disease development.**

Xylella fastidiosa resides not only in economically important hosts (such as oak), but also in vegetation (such as weeds) where symptoms may or may not occur (called

alternative hosts). Xylem-feeding insects, particularly leafhoppers, can be polyphagous, feeding on many different hosts within a single season. Many of these alternative hosts serve as a food source for potential leafhopper vectors, and many leafhoppers overwinter as adults on these alternative hosts. Transmission experiments have shown that alternative hosts may be the source of a substantial amount of inoculum that is transmitted to economically important crops by vectors that feed on both types of hosts.

Alternative host vegetation survey. Work has continued at Rutgers to help identify herbaceous perennials or other weeds that may serve as a source of inoculum for more valuable oaks. Surveys were conducted at four sites (Mercer County Community College, Duke Farms, Rutgers Gardens, and Riverview Cemetery) in 2004. At each location, all plant species within a 100-m radius of several oaks symptomatic for BLS were identified, and representative samples were subject to ELISA for the presence of *X. fastidiosa*. To improve detection of the pathogen in asymptomatic hosts, Zhang (graduate assistant assigned to this project) statistically calculated an optical density index of 2.0 for the ELISA procedure; plants with an index above this threshold were considered positive. Using these criteria, 46 species in 31 families were confirmed as hosts for *X. fastidiosa* (Table 3). In future work, life history (oviposition and life stage development) of potential vectors associated with those hosts will be studied, and bacterial strains isolated from alternative host vegetation will be used in transmission experiments.

Table 3. Summary of alternative host plants as determined by ELISA in 2004

Family	No. of species	Representative species
Rosaceae	5	raspberry, crabapple, cherry
Poaceae	4	crabgrass, stilt grass, orchardgrass
Asteraceae	3	dandelion, thistle, coreopsis
Fabaceae	3	clover, black locust, butternut
Lamiaceae	3	ground ivy, selfheal, lemon thyme
Oxalidaceae	2	wood sorrel
Plantaginaceae	2	common plantain, narrowleaf plantain
Polygonaceae	2	prostrate knotweed, smartweed
Other (23 families)		barberry, poplar, Virginia creeper

4. Characterize strains of *Xylella fastidiosa* from oak.

Although all strains of *X. fastidiosa* are grouped as a single species, they differ in host range, pathogenicity, nutritional fastidiousness, and DNA homology. Based on DNA-DNA relatedness assays and 16S-23S spacer region variation and other coding loci, North American strains of *X. fastidiosa* have been grouped into several subspecies, and oak isolates from Florida and Georgia are placed in the *X. fastidiosa* subsp. *multiplex* taxon. To better understand how BLS spreads in New Jersey, it has become critical to isolate and characterize bacterial strains specific to New Jersey oak.

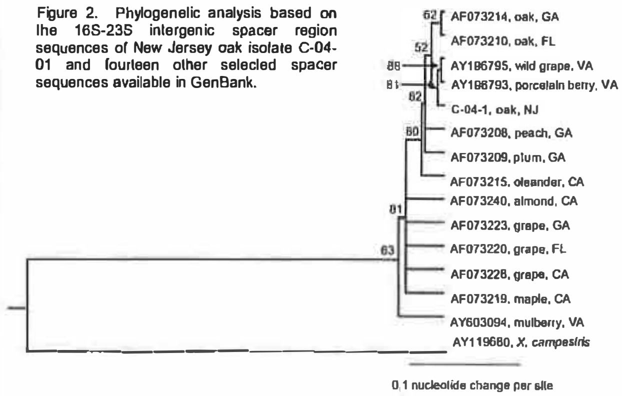

Figure 2. Phylogenetic analysis based on the 16S-23S intergenic spacer region sequences of New Jersey oak isolate C-04-01 and fourteen other selected spacer sequences available in GenBank.

Characterization of *X. fastidiosa* strains from oak. In 2004, the Rutgers BLS working group obtained 18 isolates of *X. fastidiosa* from red (11 isolates) and pin (7 isolates) oaks symptomatic for BLS. These oak trees were located in seven sites in four counties in central New Jersey. From July to October 2004, bacteria were isolated from leaf petiole tissue; historically, strains from oak have been very difficult to obtain and this represents a major achievement. The isolates were confirmed to be *X. fastidiosa* using ELISA as well as PCR with primers specific to this pathogen. In addition, all New Jersey strains, regardless of host origin or location, were identical in nucleotide sequence and shared greater than 95% nucleotide sequence identity with *X. fastidiosa* strains isolated from other hosts. A phylogenetic tree using primer sequences revealed a monophyletic clade with porcelain berry from Virginia and oaks from New Jersey, Florida, and Georgia (23) (Figure 2). Interestingly, oak strains from New Jersey are not identical to those isolated strains from the southeastern U.S. Isolates obtain in 2005 are being characterized; further analysis may help to reveal the source of the New Jersey isolates and help to track movement of the bacterium between alternate host vegetation, vector, and oak host.

5. Assess physiological differences between symptomatic and asymptomatic oaks.

Two important questions that remain unanswered are 1) why some oak species appear more tolerant than to *X. fastidiosa* than others, and 2) why diseased trees within populations of oaks appear randomly. One hypothesis is that disease susceptibility or attractiveness to vectors for feeding may be due to differences in xylem structure and fluid chemistry among hosts. Both the pathogen and vector subsist on xylem fluid; while nutritionally poor, the medium does contain a diversity of amino, organic, and inorganic acids. The quantity and quality of xylem sap varies with plant age, season, time of day, location in the plant, and general plant health. Manipulation of xylem chemistry could present new approaches to disease management. In addition, information obtained may be used to ascertain whether oak is an important feeding host for potential insect vectors, and this may help to explain the random pattern of disease development within small plantings of trees and vector behavior.

Xylem nutritional profiles. In 2005, the Rutgers BLS working group initiated a study to examine xylem water pressure and xylem nutritional profiles among oak species. Xylem fluid was obtained from symptomatic red and pin oaks as well as asymptomatic red, pin, and white oaks using a pressure chamber modified for use on small plant branches. Determination of the various acid profiles in xylem sap is underway by Dr. Peter Andersen of the University of Florida. In preliminary water pressure findings, a negative

relationship was evident between water pressure and the degree of infection, indicating that the xylem vessels of infected plants are sufficiently compromised to impact water movement through the tree. Water pressure, however, differs little among healthy trees, regardless of species.

6. **Technology transfer to community foresters and shade tree commissions.**

Much of this work has been published in the appropriate scholarly venues. Results from preliminary work on this problem (2002-2005) were presented as abstracts at two national meetings of the American Phytopathological Society, with plans to publish full papers on the presented topics within the next year. In addition, Gould was invited to write two on-line journal articles for the American Phytopathological Society: An *APSnet* feature on the background and significance of the disease (www.apsnet.org); and a plant disease lesson (in review) designed to introduce students and lay audiences to diseases caused by *Xylella fastidiosa*, featuring BLS.

To keep stakeholders up to date, pertinent results have been (and will continue to be) included in trade and Extension publications, educational programs, seminars, and workshops. A Web site is in preparation to serve all stakeholder groups, on which a video streaming product that depicts the symptoms, spread, and management options of BLS will be included. The popular series "If Plants Could Talk" (IPCT) on PBS, which reaches a potential audience of over 500,000 households in the central New Jersey area, will air a piece on BLS in spring of 2006. This segment will also be prepared for streaming on the IPCT Web site, which has over 8 million hits to date, and will also be placed on the RCRE Web site as an educational video. A pictorial key of xylem-feeding insects for use in early monitoring will be available to arborists and community foresters in 2006, and by 2007, we plan to publish a document targeted for use by stakeholders that summarizes the state of the knowledge of the problem.

Through efforts of the BLS working group, statewide, regional, and national audiences have been introduced to this disease. Groups interested in learning about BLS include municipal arborists, foresters, golf course superintendents, landscape professionals, growers of nursery crops, master gardeners, and the general public. Members of the working group, particularly Gould and Lashomb, have addressed national or regional numerous times, and Rutgers will continue to serve as a source of information concerning BLS.

BLS Working Group Members:

Ann Gould
Co PI-Leader
Assoc. Prof./Ext. Specialist
Dept. Plant Biology and Pathology

Jim Lashomb
Co PI-Leader
Prof./Ext. Specialist
Dept. Entomology

George Hamilton
Investigator
Prof./Ext. Specialist
Dept. Entomology

Mark Vodak
Investigator
Assoc. Prof. /Ext. Specialist
Dept. Ecology, Evolution, and Natural Resources

Jason Grabosky
Investigator
Asst. Prof./Ext. Specialist
Dept. Ecology, Evolution, and Natural Resources

Jason Zhang
Graduate Assistant and Technician

Richard Obal
Investigator
Prof./County Agricultural Agent
Rutgers Cooperative Extension

Halina Stanisweiska
Technician

Richard Buckley
RCE Plant Disease Diagnostician

Bernard N. Isaacson
Undergraduate Research Assistant